

## Description of a new species of the fish genus *Acanthoplesiops* Regan (Teleostei: Plesiopidae: Acanthoclininae) from Tonga

RANDALL D. MOOI<sup>1</sup> & ANTHONY C. GILL<sup>2</sup>

<sup>1</sup> Vertebrate Zoology Section, Milwaukee Public Museum, 800 West Wells Street, Milwaukee, Wisconsin 53233, U.S.A.; mooir@mpm.edu

<sup>2</sup> School of Life Sciences, Arizona State University, Tempe, Arizona 85287-4501, U.S.A.; Anthony.Gill@asu.edu

### Abstract

*Acanthoplesiops naka* sp. n. is described from the 9.9 mm SL holotype collected at Ofolanga Island of the Ha'apai Group of Tonga. Its dorsal-fin spine count of XVIII is unique in the genus. The following combination of characters also distinguishes it from congeners: first two dorsal-fin pterygiophores in the 3<sup>rd</sup> interneural space (anterior dorsal-fin formula  $?/I+I/I/I/I/I/I/I$ ); 3 dentary pores; 2 intertemporal pores; head and body generally brownish with darker pigment spots (from shrunken melanophores), excepting a paler stripe from the anterior half of the symphyseal flap on the lower lip to the origin of the dorsal fin (continuing on to the first dorsal spine), a pale spot on the pectoral-fin base, and a pale caudal peduncle continuous with pale bases of last 3 segmented dorsal- and anal-fin rays; regular ctenoid scales; no membranous attachment of last dorsal- or anal-fin rays to caudal fin. The new species might be the sister taxon to *A. psilogaster* as they share the putative derived character of two dorsal-fin pterygiophores in the 3<sup>rd</sup> interneural space.

**Key words:** Plesiopidae, Acanthoclininae, *Acanthoplesiops naka*, new species, taxonomy, Tonga

### Introduction

The Plesiopidae is an Indo-Pacific family of small, tropical and subtropical reef-associated fishes. The family is divided into six subfamilies: Trachinopinae, Assessorinae, Paraplesiopinae, Fraudellinae, Plesiopinae and Acanthoclininae (Mooi 1993). The Acanthoclininae were revised by Smith-Vaniz and Johnson (1990) who recognized twelve species in four genera: *Acanthoclinus*, *Acanthoplesiops*, *Belioops*, *Belonepterygion*. *Acanthoplesiops* is considered to have four valid species, all very small with no specimens larger than 27 mm SL. The genus is unique among acanthoclinines (and plesiopids) in

having the following characters: 1–2 secondary opercular spines (Smith-Vaniz & Johnson 1990: 249, mistakenly reported that *Fraudella* “has a series of prominent spines on the posterior margin of the opercle”; the serrations are actually on the preopercle); pectoral radial formula 3-0-1; supracleithral lateral-line canal absent; anterior/posterior ceratohyal suturing both medial and lateral; scales in mid-lateral series bilobed. Smith-Vaniz and Johnson (1990) noted a distributional puzzle presented by *Acanthoplesiops* in that there is no Australian representative. Mooi and Gill (in press) addressed this by providing evidence that *Notograptus*, an Australian endemic and previously a separate family, is sister to *Acanthoplesiops*.

While gathering comparative material for an investigation of the relationships of *Notograptus* among acanthoclinines (Mooi & Gill in press), we found a USNM specimen of *Acanthoplesiops* from Tonga identified as *A. indicus* (Day). Although the specimen resembles that species in colour pattern, given that *A. indicus* was previously considered restricted to the western and central Indian Ocean (Smith-Vaniz & Johnson 1990), its reported occurrence in the south-west Pacific demanded closer inspection. We herein describe the Tongan *Acanthoplesiops* as a new species.

## Materials and methods

Nomenclature of head pores follows Gill *et al.* (2000). Osteology was determined from x-radiographs. An anterior dorsal-fin pterygiophore formula is modified from Gill and Randall (1992), with Roman numerals representing the number of spines on each pterygiophore. Vertebral counts are presented in the form precaudal + caudal elements, the latter including the terminal urostylar complex; the first caudal vertebra was identified as that with the hemal spine just anterior to the anterior anal-fin pterygiophore. Terminology of ribs and intermuscular bones follows Patterson and Johnson (1995). Other methods of counting and measuring follow Winterbottom (1986). Measurements and counts taken from x-radiographs where possible (supraneurals were not discernible; bony interorbital and pectoral length were taken from specimen). Institutional codes follow Leviton *et al.* (1985), excepting SAIAB for the South African Institute of Aquatic Biology (formerly RUSI).

Comparisons with other *Acanthoplesiops* species are based on data provided by Hardy (1985) and Smith-Vaniz and Johnson (1990), as well as from the following specimens (all specimens preserved in alcohol and x-rayed, unless otherwise stated): *A. echinatus* Smith-Vaniz & Johnson, ANSP 166316 (21 mm SL, Ambon, Moluccas, Indonesia), BPBM 34177 (19.8 mm SL, holotype, Ambon, Moluccas, Indonesia), USNM 146453 (21 mm SL, paratype, Jolo, Sulu Arch., Philippines), USNM 372741 (16 mm SL, Mindoro, Philippines), FMNH 113520 (23.2 mm SL, Apo Reef, Philippines); *A. hiatti* Schultz, ANSP 165421 (18.8 mm SL, cleared and stained, Saparua Is., Banda Sea, Indonesia), USNM 135783 (2: 15–16 mm SL, Morangas Is., Sulu Arch., Philippines), USNM 140754

(paratype, 19.1 mm SL, Rongerik Atoll, Marshall Is.), USNM 140755 (paratype, 15.5 mm SL), USNM 140756 (paratype, 10 mm SL, Rongerik Atoll, Marshall Is.), USNM 140757 (paratypes, 3: 13.0–20.3 mm SL, Rongerik Atoll, Marshall Is.), USNM 140758 (holotype, 16.8 mm SL, Rongerik Atoll, Marshall Is.), USNM 141370 (paratype, 16.1 mm SL, Rongerik Atoll, Marshall Is.), USNM 164948 (17.3 mm SL, Pilas Is., near Zamboanga, Philippines), USNM 232049 (15.3 mm SL, Sombrero Is., Batangas, Philippines), USNM 236652 (15.3 mm SL, Malolo Is., Fiji), USNM 257631 (18.5 mm SL, Saparua Is., Banda Sea, Indonesia), USNM 257874 (7: 15.3–21.0 mm SL, Saparua Is., Banda Sea, Indonesia); *A. indicus* (Day), ANSP 122483 (27 mm SL, cleared and stained, Mangapwani, Zanzibar), ANSP 165570 (22 mm SL, cleared and stained, Durban, South Africa), BMNH 1889.8.17.5 (19 mm SL, holotype, Madras, India), SAIAB 17291 (9: 12.2–24.1 mm SL, 21 mm specimen cleared and stained, Durban, South Africa), SAIAB 17293 (22 mm SL, Mombasa, Kenya); *A. psilogaster* Hardy, USNM 257872 (holotype, 22.6 mm SL, Ch'uan-fan-shih, Taiwan), USNM 257871 (paratype, 18.7 mm SL, Ch'uan-fan-shih, Taiwan), USNM 257873 (paratype, 17.7 mm SL, Ch'uan-fan-shih, Taiwan), USNM 276528 (paratype, 18.8 mm SL, Ch'uan-fan-shih, Taiwan), USNM 288813 (12 mm SL, Batan Is., Philippines), USNM 318027 (22 mm SL, Maybag Is., Philippines), USNM 326763 (2: 15–16 mm SL, Batanes Prov., Philippines).

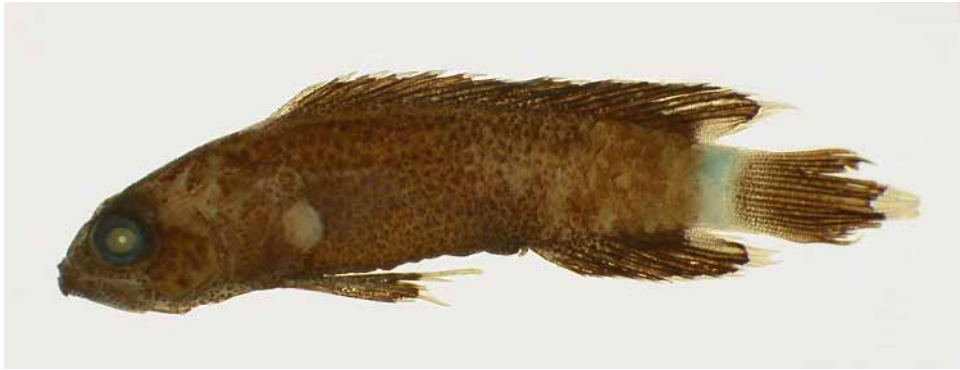
***Acanthoplesiops naka* sp. n.**

Tongan Spiny Basslet

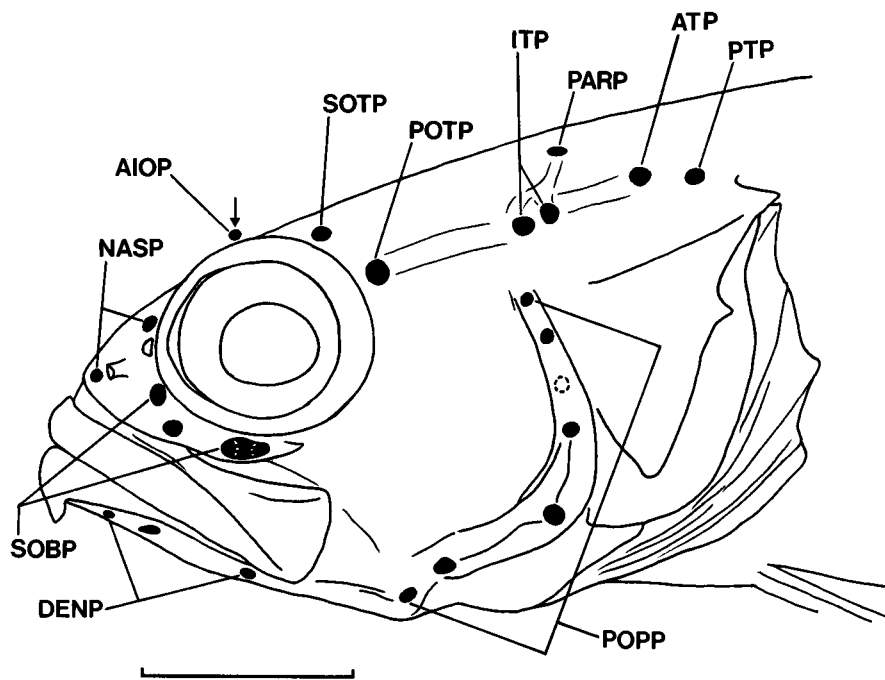
Figures 1–2, Table 1

*Holotype.* USNM 327794, 9.9 mm SL, Tonga, Ha'Apai Group, Ofolanga Island, 19°36'15"S 174°28'15"W, deep reef slope and wall off SW side of island, near vertical coral wall with sandy channel at base and steep dropoff at end, 70–105 ft (21–32 m), J.T. Williams, B.B. Collette, G.D. Johnson, D.G. Smith, C.C. Baldwin, E.A. Powers, et al., rotenone and dipnet, 12 Nov 1993 (field number JTW 93–30).

*Diagnosis.* A species of *Acanthoplesiops* with the following combination of characters: dorsal-fin rays XVIII,4; anterior dorsal-fin pterygiophore formula  $?/I+I/I/I/I/I/I$ ; 3 dentary pores; 2 intertemporal pores; head and body generally brownish with darker pigment spots (from shrunken melanophores), excepting a pale stripe from the anterior half of the symphyseal flap to origin of dorsal fin continuous with a pale first dorsal spine, a pale spot on the pectoral-fin base, and a pale caudal peduncle continuous with pale bases of last 3 segmented dorsal- and anal-fin rays, median fins slightly darker than body colour with pale tips to their rays, pectoral fin hyaline with darker outlines to rays, pelvic-fin spine dark with pale tip, first pelvic-fin ray dark on proximal two-thirds and pale on distal third, second pelvic-fin ray dark except for extreme distal tip; regular ctenoid scales; no membranous attachment of last dorsal- or anal-fin rays to caudal fin.



**FIGURE 1.** *Acanthoplesiops naka*, USNM 327794, 9.9 mm SL, holotype, Tonga, Ha'Apai Group, Ofolanga Island (photo of preserved specimen by R. Mooi).



**FIGURE 2.** Head of *Acanthoplesiops naka*, USNM 327794, 9.9 mm SL, holotype, showing distribution of cephalic sensory pores (in black; arrow indicates pore not visible in lateral view; dotted circles show position of pores only on right side). AIOP, anterior interorbital pore; ATP, anterior temporal pore; DENP, dentary pores; ITP, intertemporal pore; NASP, nasal pores; PARP, parietal pores; POPP, preopercular pores; POTP, posterior otic pore; PTP, posttemporal pore; SOBP, suborbital pores; SOTP, suprotic pore. Scale bar = 1 mm. (drawing by R. Mooi)

*Description.* Dorsal-fin rays XVIII,4, first two segmented rays branched; number of supraneurals not discernible from x-rays, anterior dorsal-fin pterygiophore formula ?/?/ I+I/I/I/I/I/I/I; anal-fin rays VII,4, first two segmented rays branched; pectoral-fin rays 16; pelvic-fin rays I,2, inner segmented ray unbranched; segmented caudal-fin rays 8 + 8, and 2 dorsal and 2 ventral procurent rays. Caudal fin not connected by membrane to last ray of dorsal and anal fins. Vertebrae 13+14 = 27; ribs present to at least the 12<sup>th</sup> precaudal vertebrae; epineural bones present to at least 12<sup>th</sup> precaudal vertebrae. Individual elements of caudal skeleton, other than rays, not discernible on x-ray.

Cephalic sensory pore openings (Fig. 2; all pores bilaterally paired unless otherwise indicated). Nasal pores 2, one pore just posterior to upper lip, second pore just above posterior nostril; anterior interorbital pores 1; supraotic pores 1; posterior otic pores 1; suborbital pores 3 on left side, 4 on right; preopercular pores 6 on left side, 7 on right; dentary pores 3; intertemporal pores 2; parietal pores 1; anterior temporal pores 1; posttemporal pores 1.

Gill membranes fused together ventrally but free from isthmus; branchiostegal rays 6; gill rakers not counted. No lateral-line scales yet apparent. Olfactory capsule with two openings; anterior opening a short tube, positioned about midway between posterior opening and edge of lip; posterior opening with slightly raised rim, positioned near anterodorsal rim of orbit (Fig. 2). Opercle with secondary opercular spine ventral to the primary spine and overlapping the subopercle (Fig. 2). Head and anterior body scaleless, posterior body with ctenoid scales. Teeth numerous, conical and small.

Morphometrics (as % of SL, from x-radiograph, excepting interorbital and pectoral length; also reported as % of HL where appropriate). Head length (HL) 35; head depth at posterior margin of eye 20 (58% HL); eye diameter 9.7 (28% HL); snout length 6.8 (19% HL); bony interorbital 4.5 (13 % HL); upper jaw length 15 (43 % HL); lower jaw length 20 (58 % HL); dorsal-fin base 63; length of dorsal-fin spines, 1<sup>st</sup> 8.4, 2<sup>nd</sup> 9.9, 3<sup>rd</sup> 12.5, 4<sup>th</sup> 13, 5<sup>th</sup> 14, 6<sup>th</sup> 14.7, 16<sup>th</sup> 17.7, 17<sup>th</sup> 18, 18<sup>th</sup> 18 (although broken); length of dorsal-fin rays, 1<sup>st</sup> 20, 2<sup>nd</sup> 17, 3<sup>rd</sup> 14, 4<sup>th</sup> 8.5; anal-fin base 23; anal-fin spine lengths, 1<sup>st</sup> 9.7, 2<sup>nd</sup> 13, 3<sup>rd</sup> 15, 4<sup>th</sup> 16, 5<sup>th</sup> 17, 6<sup>th</sup> 18, 7<sup>th</sup> 19; anal-fin ray lengths, 1<sup>st</sup> 20, 2<sup>nd</sup> 19, 3<sup>rd</sup> 14.3; 4<sup>th</sup> 10.2; pectoral-fin length 17; pelvic-fin spine length 18; 1<sup>st</sup> pelvic-fin ray length 39; middle caudal-fin ray length 28; snout tip to dorsal-fin origin 38; snout tip to pelvic-fin base 35; snout tip to origin of anal fin 70; body depth at anal-fin origin 21; dorsal-fin origin to pelvic-fin base 24; dorsal-fin origin to anal-fin origin 43; dorsal-fin origin to anal-fin insertion 63; pelvic-fin base to anal-fin origin 35; anal-fin origin to dorsal-fin insertion 62; dorsal-fin insertion to anal-fin insertion 14; hypural depth 11; peduncle length 9.5; peduncle depth 13; anal-fin insertion to upper hypural 13; dorsal insertion to lower hypural 13.

Live coloration. Unknown.

Preserved coloration (Fig. 1). Head and body generally brownish with darker pigment spots (from shrunken melanophores), excepting a pale stripe from the anterior half of the symphyseal flap to origin of dorsal fin continuous with a pale first dorsal spine, a pale spot

on the pectoral-fin base, and a pale caudal peduncle continuous with pale bases of last 3 segmented dorsal- and anal-fin rays, median fins slightly darker than body colour with pale tips to their rays, pectoral fin hyaline with darker outlines to rays, pelvic-fin spine dark with pale tip, first pelvic-fin ray dark on proximal half and pale on distal half, second pelvic-fin ray dark except for extreme distal tip.

**TABLE 1.** Frequencies of selected meristics of *Acanthoplesiops* species. Asterisks mark holotype values except where specimen is unique.

#### DORSAL FIN

Species	Spines				Segmented Rays				Total Elements				
	18	19	20	21	3	4	5	6	22	23	24	25	26
<i>A. echinatus</i>		3	2*				2	3*			1	3	1*
<i>A. hiatti</i>		10*	11	1		17*	5			5*	16	1	
<i>A. indicus</i>		11*	2		1	12*				12	1		
<i>A. psilogaster</i>		9*	1		1	7	2*			8	2*		
<i>A. naka</i>	1					1			1				

#### ANAL FIN

Species	Spines				Segmented Rays				Total Elements			
	7	8	9	10	3	4	5	6	11	12	13	14
<i>A. echinatus</i>	1	4*					2*	3			3*	2
<i>A. hiatti</i>		4	10*	8	3	14*	5			2	12*	8
<i>A. indicus</i>			9	4*	2	11*					11	2*
<i>A. psilogaster</i>	4	6*				9*	1		3	7*		
<i>A. naka</i>	1					1			1			

#### VERTEBRAE

Species	Abdominal			Caudal				Total			
	12	13	14	14	15	16	17	27	28	29	30
<i>A. echinatus</i>			5		2	3*				2	3*
<i>A. hiatti</i>	2	20*			2	17*	3		3	17*	2
<i>A. indicus</i>	13				1	12*		1	12*		
<i>A. psilogaster</i>		3	7*	9*	1				10		
<i>A. naka</i>		1		1				1			

#### CAUDAL PROCURRENT RAYS

Species	Dorsal		Ventral	
	2	3	2	3
<i>A. echinatus</i>		5	1*	4
<i>A. hiatti</i>		21	2	19*
<i>A. indicus</i>	13		13	
<i>A. psilogaster</i>	10		10	
<i>A. naka</i>	1		1	

**Habitat and distribution.** The only specimen was collected from the SW side of Ofo-langa Island of the Ha'Apai Group of Tonga at 19°36'15"S 174°28'15"W. It was found between 21 and 32 m off of a deep reef slope with a near vertical coral wall having a sandy channel at its base followed by a steep dropoff.

**Etymology.** The epithet 'naka' is derived from the first letters of our respective children's names, Aaron and Adam (RDM) and Nat and Kelly (ACG). The minute size of the holotype is reflective of the still comparatively small sizes of our children.

## Comparisons

*Acanthoplesiops naka* resembles *A. indicus* in having a broad pale band on the caudal peduncle and posteriormost rays of the dorsal and anal fins (Fig. 1). As a result, it was initially catalogued as *A. indicus*. However, *A. naka* is distinguished from *A. indicus* in having only XVIII dorsal-fin spines (vs XIX–XX), three dentary pores (vs four), two intertemporal pores (vs one; the smallest *A. indicus* available, SAIAB 17291 12.2 mm SL, has only one intertemporal pore on right side but might have two on the left, some damage makes it difficult to interpret), two dorsal-fin pterygiophores inserted into the 3<sup>rd</sup> interneural space (vs one), ctenoid scales (vs modified "cycloid", see Smith-Vaniz & Johnson, 1990: 235) and no membrane joining the last dorsal- and anal-fin rays to the caudal rays. We could not determine the number of supraneurals in *A. naka*, but we note that although *A. indicus* is reported as having no supraneurals, one of 13 specimens (SAIAB 17293) we examined had one in the first interneural space.

*Acanthoplesiops naka* differs from all other congeners by the broad pale band on the caudal peduncle, two intertemporal pores, and the uniquely low dorsal-fin spine count (XVIII vs XIX–XXI). *A. naka* also exhibits a lower number of total dorsal- and anal-fin elements, and lower total vertebral number (Table 1). *A. psilogaster* does share the condition of two dorsal-fin pterygiophores in the 3<sup>rd</sup> interneural space and an unscaled belly anteriorly (this latter similarity might be due to lack of scale development in the apparently juvenile holotype of *A. naka*). However, even the smallest specimen of *A. psilogaster* (11.8 mm SL, USNM 288813) shows no trace of a pale caudal peduncle and has only one intertemporal pore on each side. We also found two specimens of *A. hiatti* with two dorsal-fin pterygiophores in the 3<sup>rd</sup> interneural space (USNM 135783, 16 mm SL and USNM 257874, 15.3 mm SL); at first, this suggested misidentification with *A. psilogaster*, but dorsal- and anal-fin counts, vertebral counts and belly scales indicate that there is occasional variation in the dorsal-fin pterygiophore formula within *A. hiatti*.

## Remarks

Smith-Vaniz and Johnson (1990) hypothesized that *A. psilogaster* and *A. echinatus* were most closely related based on the putatively derived conditions of three dentary pores and a reversal to teeth present on the 2<sup>nd</sup> infrapharyngobranchial. *A. naka* also has only three dentary pores, and although the condition of the dentition on the 2<sup>nd</sup> infrapharyngobranchial will have to await the collection of more specimens, it appears that the new species should be considered related to *A. psilogaster* and *A. echinatus*. Among these three species, *A. naka* is most likely to be the sister taxon to *A. psilogaster* of Japan, Taiwan and extreme northern Philippines. They share two features previously thought to be unique to *A. psilogaster* within the genus: two dorsal-fin pterygiophores inserted in the 3<sup>rd</sup> interneural space and belly unscaled anteriorly. The homology of the former is perhaps challenged by our discovery of the variable dorsal-fin pterygiophore formula found in *A. hiatti* (2 of 22 specimens with two pterygiophores in the 3<sup>rd</sup> interneural space), and the latter is of dubious value given that the *A. naka* specimen is small with incomplete scale development. However, without any additional evidence, we tentatively insert the new species as the sister to *A. psilogaster* in the phylogeny of *Acanthoplesiops* presented by Mooi and Gill (in press) resulting in the following relationships: *A. hiatti*(*A. indicus*(*A. echinatus*(*A. naka* + *A. psilogaster*))).

It is difficult, if not futile, to make conclusions regarding biogeography based on a single specimen whose phylogenetic relationships are uncertain. However, the distribution of *Acanthoplesiops* has been extended eastward to Tonga and there now appear to be three allopatric West Pacific species that form a clade; *A. echinatus* in the Moluccas and Sulu Sea is the sister to *A. naka* in Tonga and *A. psilogaster* in Japan, Taiwan and extreme northern Philippines. *Acanthoplesiops indicus* from the Indian Ocean is sister to this clade, but the history of the genus becomes more complicated with the basal position of *A. hiatti* which is again West Pacific, being sympatric with *A. echinatus* in the west as well as being found in Fiji and onto the Pacific plate in the Marshall Islands. This does not impact the broader conclusions of Mooi and Gill (in press) that a sister relationship of *Acanthoplesiops* and *Notograptus* follows a general pattern where Indo-West Pacific taxa are sister to an Australian clade.

We also note that there are some apparent geographical differences in meristics within at least two species (Table 2). *Acanthoplesiops echinatus* exhibits higher dorsal-fin spine counts in Moluccan specimens, and perhaps a trend to higher segmented anal-fin ray counts in the Philippines. These might deserve some attention when further specimens are available, particularly as only Moluccan specimens are known to have the pointed papillae covering much of the head for which the species is named (Smith-Vaniz & Johnson, 1990). *Acanthoplesiops hiatti* from Marshall Islands of the Pacific plate, and the single Fijian specimen, have lower dorsal-fin spine counts and tend to have lower anal-fin spine counts than western populations. A more thorough survey of characters among these populations

might reveal additional differences that would more clearly indicate separate evolutionary histories and endemism.

**TABLE 2.** Frequencies of selected meristics by locality for *Acanthoplesiops* species where geographic variation was noted.

DORSAL FIN											
Species	Locality	Spines			Segmented Rays			Total Elements			
		19	20	21	4	5	6	23	24	25	26
<i>A. echinatus</i>	Moluccas		2*			1	1*			1	1*
	Philippines	3				1	2		1	2	
<i>A. hiatti</i>	Marshalls	7*	1		6*	2		5*	3		
	Fiji	1				1			1		
	Philippines	1	3		3	1			4		
	Banda Sea	1	7	1	8	1			8	1	

ANAL FIN												
Species	Locality	Spines				Segmented Rays				Total Elements		
		7	8	9	10	3	4	5	6	12	13	14
<i>A. echinatus</i>	Moluccas		2*					1*	1		1*	1
	Philippines	1	2					1	2		2	1
<i>A. hiatti</i>	Marshalls		4	4*			6*	2		2	6*	
	Fiji			1			1				1	
	Philippines			1	3	1	3				2	2
	Banda Sea			4	5	2	4	3			3	6

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## References

- Gill, A.C., Mooi, R.D. & Hutchins, J.B. (2000) Description of a new subgenus and species of the fish genus *Congrogadus* Günther from Western Australia (Perciformes: Pseudochromidae). *Records of the Western Australian Museum*, 20(1), 69–79.
- Gill, A.C. & Randall, J.E. (1992) *Pseudochromis steenei*, a new sexually dimorphic species of dottyback fish from Indonesia (Perciformes: Pseudochromidae). *Revue française d'Aquariologie Herpétologie*, 19(1 et 2), 41–46.
- Hardy, G.S. (1985) Revision of the Acanthoclinidae (Pisces: Perciformes), with descriptions of a new genus and five new species. *New Zealand Journal of Zoology*, 11, 357–393 (for 1984).
- Leviton, A.E., Gibbs, R.H., Jr, Heal, E. & Dawson, C.E. (1985) Standards in herpetology and ichthyology: Part 1. Standard symbolic codes for institutional resource collections in herpetology and ichthyology. *Copeia*, 1985(3), 802–832.
- Mooi, R.D. (1993) Phylogeny of the Plesiopidae (Pisces: Perciformes) with evidence for the inclusion of the Acanthoclinidae. *Bulletin of Marine Science*, 52(1), 284–326.
- Mooi, R.D. & Gill, A.C. (In press) Notograptidae, sister to *Acanthoplesiops* Regan (Teleostei: Plesiopidae: Acanthoclininae), with comments on biogeography, diet and morphological convergence with Congrogadinae (Teleostei: Pseudochromidae). *Zoological Journal of the Linnean Society*.
- Patterson, C. & Johnson, G.D. (1995) The intermuscular bones and ligaments of teleostean fishes. *Smithsonian Contributions to Zoology*, (559), 1–85.
- Smith-Vaniz, W.F. & Johnson, G.D. (1990) Two new species of Acanthoclininae (Pisces: Plesiopidae) with a synopsis and phylogeny of the subfamily. *Proceedings of the Academy of Natural Sciences of Philadelphia*, (142), 211–260.
- Winterbottom, R. (1986) Revision and vicariance biogeography of the subfamily Congrogadinae (Pisces: Perciformes: Pseudochromidae). *Indo-Pacific Fishes*, (9), 1–34, pl. I.